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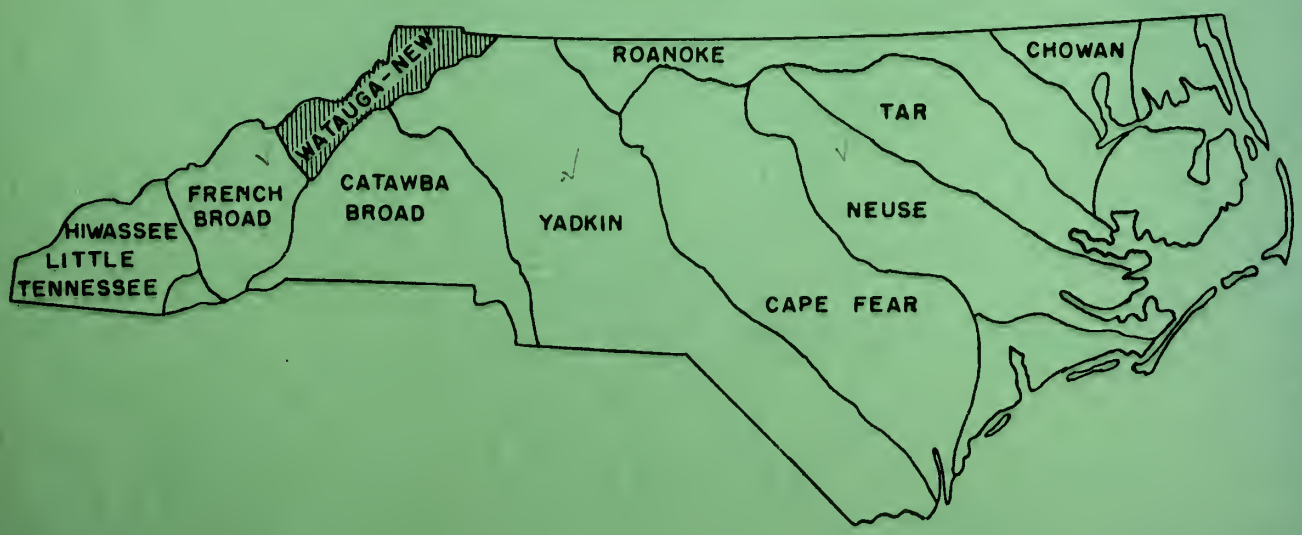
WATER RESOURCES OF NORTH CAROLINA
KANAWHA AND WATAUGA RIVER BASINS



RALEIGH
1959

FOREWORD

This publication comprises Volume XI of a series of twelve volumes containing information regarding water resources of North Carolina. Volumes I to X were published as follows:

I	State as a whole, January 1955
II	Neuse River Basin, May 1955
III	Yadkin-Pee Dee River Basin, August 1955
IV	Chowan River Basin, December 1955
V	Roanoke River Basin, February 1957
VI	French Broad River Basin, November 1957
VII	Cape Fear River, September 1958
VIII	Broad and Catawba River Basins, October 1958
IX	Tar-Pamlico River Basin, November 1958
X	Hiwassee and Little Tennessee River Basins, December 1958.

Volume XII will provide an inventory of the water resources of the Coastal Plain River Basins. The draft of this inventory has been completed. When the series have been published, probably by the end of 1959, information pertaining to the entire State will be available to assist in the orderly planning and development of the water facilities required for municipal and industrial expansion and for expansion of the uses of water for agriculture, and to guide watershed authorities, basin associations, soil conservation districts, and other agencies concerned with water uses in accomplishing their purposes.

It is hoped that this publication will assist in the location, development, and expansion of municipal, agricultural, and other water supplies, and serve as a guide to the future study of water resources in the Kanawha and Watauga River Basins.

Grateful appreciation is hereby extended to persons who provided material for this volume as follows:

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Chapter II - Geological Survey, U. S. Department of the Interior.

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Chapter V - Geological Survey, U. S. Department of the Interior.

Chapter VI - Geological Survey, U. S. Department of the Interior.

Chapter VII - Geological Survey, U. S. Department of the Interior.

Chapter VIII - North Carolina State Stream Sanitation Committee.

Chapter IX - Soil Conservation, U. S. Department of Agriculture.

Chapter X - Corps of Engineers, U. S. Army.

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CHAPTER I - DESCRIPTION OF WATERSHED

Location and Area - The Kanawha and Watauga River Basins are located in the extreme northwestern part of North Carolina. The headwaters of the Kanawha River are the North Fork New River and the South Fork New River, which flow in Ashe County, and the Little River which flows in Alleghany County. The New River which is formed by the confluence of North Fork and South Fork near the Virginia-North Carolina State line, flows northeasterly and northwesterly in Virginia, and northwesterly in West Virginia to its confluence with the Kanawha River at Charleston, West Virginia. The Kanawha River joins the Ohio River about 35 miles northeast of Huntington, West Virginia. The Watauga River joins the Holston River, a tributary of the Tennessee River, at Boone Dam about 10 miles northwest of Johnson City, Tennessee.

The drainage areas of the Kanawha and Watauga River Basins in North Carolina are 760 square miles and 220 square miles, respectively. The Kanawha River Basin comprises Ashe County, Alleghany County, and the middle portion of Watauga County. The Watauga River Basin comprises the western portion of Watauga County and the northwestern portion of Avery County.

Topography and Geology - The topography of the basins is characterized by numerous high mountains with steep slopes, interspersed with lower mountains having more gentle slopes and smooth and gently-rolling country between the mountains. The average elevation of the whole area is between 3,000 and 3,500 feet. The highest elevation in Ashe County, is that of Peak Mountain, which is 5,195 feet.

In the northwestern part of Ashe County and along the western border of the basins, the rocks are of Pre-cambrian granite or gneiss. The greater portion of the area, covered by the two basins, is made up of Pre-Cambrian or Palaeozoic granite or biotite schist. In the lower part of Watauga County, some slates and shales of the Cambrian era are found.

Cover and Climate - Approximately 50 percent of the area, covered by these basins, consists of forest lands. The remainder is cultivated land, farm woodland, and woodland pasture.

The mean annual temperature varies from 53 degrees on the eastern edges to 50 degrees in the south-central part of the area. The annual mean-precipitation for the entire area is approximately 52 inches.

Population - Over the period from 1900 to 1930, inclusive, the total population of the Kanawha and Watauga River basins increased from 40,757 to 43,370, an increase of approximately 6.5 percent. There were no towns of 2,500 or more population in either of the basins; therefore, the total population of both may be classed as 100 percent rural over the period. Populations of municipalities in the two basins are shown below.

Municipality	1940	1950
Banner Elk, Avery Co.	344	462
Blowing Rock, Caldwell-Watauga Cos.	654	661
Boone, Watauga Co.	1,788	2,973
Elk Park, Avery Co.	467	545
Jefferson, Ashe Co.	304	359
Lansing, Ashe Co.	- -	274
Sparta, Alleghany Co.	648	820
West Jefferson, Ashe County	883	871

Populations (1940 and 1950) of the four counties lying wholly or partially within the Kanawha and Watauga RiverBasins may be found hereafter in this chapter under "General Information regarding Counties".

Agriculture - The chief agruclutural pursuits of the basins are stock raising and growing of hay and grain crops. The soils are adapted to growing a variety of agricultural products. It may be stated that the principal occupation of the inhabitants of these two basins is the raising of livestock and agricultural products.

Lumbering - Some lumbering operations are carried on in the area, although not on as large a scale at present as it has been in the past. Principal types of commercial timber are oak, hickory, pine, maple, ash, poplar, and walnut. Spruce and fir are found on the mountain summits in this region.

Minerals - There are eight feldspar mines in the Kanawha River Basin and one iron mine in the Watauga River Basin. There is a large deposit of soapstone in Ashe County. Numerous deposits of feldspar and mica, and good copper and iron-ore deposits, are located in the area covered by these two basins. Development of these deposits was hindered in the past by limited-transportation facilities; now, with improved highways, interest in their development has occurred.

Transportation - Because of the nature of the mountain streams, there are no facilities for water-borne commerce in either of the two basins.

No facilities for air transportation are known to be available in either of these basins.

Two railroads are operated in the area. The Eastern Tennessee and Western North Carolina Railway (narrow gauge), located in the southern part of the Watauga River basin, extends westward from Boone, Watauga County, into Tennessee. The Abingdon branch of the Norfolk and Western Railway extends from Todd, on the Watauga-Ashe County line, through West Jefferson and Warrensville, Ashe County, to Abingdon, Washington County, Virginia.

The principal highways in the basins are as follows:

U. S. Highway 421 from Winston-Salem to Bristol, Virginia-Tennessee, through Deep Gap, Boone, Vilas, Sugar Grove, and Zionville.

U. S. Highway 221 from Asheville to Roanoke, Virginia, through Deep Gap, West Jefferson, Scottville, and Twin Oaks.

N. C. Highway 194 from the Virginia-North Carolina State line to Ingalls on U. S. Highway 19E through Helton, Lansing, Warrensville, West Jefferson, Baldwin, Todd, Boone, Vilas, Valle Crucis, Banner Elk, Heaton, Newland, and Crossnore.

Streams of the Basins - Watauga River rises in Avery County, near the Avery-Watauga County line, about 10 miles southwest of Boone, Watauga County; flows northeasterly and northwesterly, in Watauga County, to the North Carolina-Tennessee State line about 7.5 miles northwest of Sugar Grove, Watauga County; and joins the Holston River as indicated hereinbefore under "Location and Area".

The principal tributary of Watauga River is Elk River, and the principal tributaries of New River are North Fork New River, South Fork New River, and Little River.

Elk River rises on the Avery-Watauga County line near Hanging Rock Mountain (Elev. 5237) and flows westerly, in Avery County, to the North Carolina-Tennessee State line about three miles northwest of Heaton, Avery County. It joins Watauga River about 1.25 miles upstream from Butler, Carter County, Tennessee, and about 11 river miles down Elk River from the North Carolina-Tennessee State line.

North Fork New River rises in Watauga County near the North Carolina-Tennessee State line about seven miles northwest of Todd, Watauga-Ashe Counties, and flows in a northeasterly direction in Ashe County, through or near Maxwell, Ashland, Creston, Clifton, Dresden, Warrensville, Crumpler, and Weavers, to its confluence with South Fork New River to form New River on the Ashe-Alleghany County line about two miles from the Virginia-North Carolina State line.

South Fork New River is formed by the confluence of East Fork, Middle Fork, and Flannery Fork about 2.5 miles southeast of Boone, Watauga County. It flows generally north in Watauga County and east, north, and northeast in Ashe County, through or near Todd, Brownwood, Fleetwood, Idlewild, Glendale Springs, Orion, and Scottville to its confluence with North Fork New River indicated in the preceding paragraph.

Little River rises in Alleghany County about 5.5 miles southwest of Sparta, flows northeasterly, in Alleghany, through or near Whitehead, Sparta, Hooker, and Ennis, to the Virginia-North Carolina State line about 7.5 miles northeast of Sparta; and joins New River in Grayson County, Virginia.

At the Virginia-North Carolina State line, New River has an elevation of about 2,435 feet. Five river miles above, at the confluence of the North and South Forks, it has an elevation of about 2,460 feet. Ninety river miles above the confluence and at its source, South Fork New River has elevations of about 2,850 and 3,120 feet, respectively. North Fork New River has an elevation of about 2,850 feet at its source. At the North Carolina-Tennessee State line and at its source, Watauga River has elevations of about 2,130 and 2,950 feet, respectively.

Mapping - The Corps of Engineers, U. S. Army, has prepared plan and profile maps of New River and its North and South Forks in connection with its studies of Moores Ferry Reservoir on New River near Galax, Virginia, for flood protection in the valleys of New, Kanawha, and Ohio Rivers (see "Chapter X - Navigation and Flood Control" hereinafter). U. S. Geological Survey topographic maps have been prepared for the area covered by the two basins, although these maps were made from surveys prior to 1896 and without spirit-level controls.

Stream Gaging - Stream-gaging stations are operated at South Fork New River near Jefferson, North Fork New River at Crumpler, Watauga River at North Carolina-Tennessee State line, Watauga River near Sugar Grove, and Elk River near Elk Park (see "Chapter V - Surface Water" hereinafter). Operation of stream-gaging stations at North Fork New River near Warrensville, South Fork River at Bowie, and South Fork New River near Crumpler have been discontinued.

General Information regarding Counties within or partially within the Kanawha and Watauga River Basins

Alleghany County - This county was formed, in 1859, from Ashe County. The name is an Indian work, the meaning of which is not known.

In the northwest-mountain section, Alleghany County lies on a high plateau of the Blue Ridge Mountains and borders on Virginia. A belt of magnetic

iron-ore and copper is found in the extreme northwest corner. A manganese-ore deposit is located near Sparta. The forest area contains oak, dead chestnut, and poplar. Waters include a short reach of New River in the northwest corner of the county; a loop of New River near the Virginia-North Carolina State line, in the middle section of the county, between entry from Virginia and re-exit into Virginia; Little River; and Elk, Rock, Moccasin, Brush, Glade, Crab, and smaller creeks.

Alleghany is a prosperous farming county with corn and hay as principal crops. Some tobacco is raised. The area has a background of apple culture. There is little commercial exploitation, however, of this crop. Livestock and dairy products are important activities. A factory, for making smoking pipes from burls of hardwood, is the principal industry of the county, the only other industry being related to lumber and lumber-products sawmills.

The farm of Representative R. L. Doughton is located at Laurel Springs, and nearby is the house in which the famous Siamese Twins were married in 1842.

Communities include Sparta (county seat), Glade Valley, Laurel Springs, Roaring Gap, and Amelia.

Rainfall (inches)	53.01
Snowfall (inches)	14.0
Mean annual temperature (degrees)	56.6
Growing season (days)	173
Tobacco (1951 Val.)	$209,120
Corn (1951 Val.)	$286,860
Hay (1951 Val.)	$467,130
Total Land Area (acres)	147,200
Forest Area (acres)	52,700
Population (1940)	8,341
Population (1950)	8,155
Total tax Val.	$5,454,361
Tax Rate	$1.55

Ashe County - This county was created, in 1799, from Wilkes County and was named in honor of Governor Samuel Ashe. Bishop Augusta G. Spagenbert, a Moravian, was said to have been among the first explorers of this region which was beginning to be settled by 1760.

The county is the most northwestern county in North Carolina and borders both Tennessee and Virginia. It is situated on a high plateau, and elevations range from 3,000 to 5,600 feet. Higher Blue Ridge mountains are along the southern border, and the Blue Ridge Parkway is on the eastern border. The forests contain white pine, oak, poplar, and chestnut. Rich, undeveloped deposits of iron, asbestos, and copper are found in the county. Waters include North Fork New River and South Fork New Rivers, and Big Laurel, Long Hope, Big Horse, Helton, Old Field, Obids, Roan, Peak, and smaller creeks.

Livestock raising is the major agricultural pursuit. The county ranks first in beef, and second in dairy cattle, in North Carolina. A State livestock test-farm is located at Transou. West Jefferson is an important market for cabbage, snap beans, and burley tobacco. Fruit (mostly apples) thrives. Most of the cheese, produced in North Carolina, is made at West Jefferson. Commercial gladiola-bulb production has been successfully introduced. Lumbering is the chief industry.

Points of interest include Pond Mountain (Elev. 5,500), unique mountain-

top meadow with ponds; Nigger Mountain (Elev. 4,700), a detached peak between Jefferson and West Jefferson and a picnicking spot and hiking goal; and other high peaks.

Communities include Jefferson (county seat), West Jefferson, Lansing, and Warrensville.

Rainfall (inches)	48.24
Snowfall (inches)	19.6
Mean annual temperature (degrees)	52.1
Growing season (days)	156-164
Livestock and Livestock Products sold (1949 Val.)	$1,828,851
Hay (1951 Val.)	$765,710
Corn (1951 Val.)	$613,570
Total Land Area (acres)	273,280
Forest Area (acres)	95,700
Population (1940)	20,664
Population (1950)	21,878
Total Tax Val.	$8,574,476
Tax Rate	$2.10

Avery County - This county was created in 1911, from Mitchell, Watauga, and Caldwell Counties. It was named for Colonel Waightstill Avery, Revolutionary Patriot and first Attorney General of North Carolina. It was the 100th and latest county created.

Avery County lies in the northwest-mountain section and is one of the highest and most rugged counties. It is predominantly rural. Feldspar and mica are produced, and asbestos and iron ore have been mined in the past. The largest deposit of amphibole asbestos in the State occurs four miles from Minneapolis. Remaining forests include dead chestnut, oak, and hemlock. Waters in the Watauga River Basin include Elk and Watauga Rivers and Buckeye, Banner Elk, Little Elk, Cranberry, and smaller creeks.

Farming, lumbering, and mining are the chief occupations. There are 55 certified seed-potato growers in the county. Vegetables, corn, and potatoes are the leading staples. Tobacco and livestock are raised. Small grains, including oats and buckwheat, are grown. Collection of herbs ("Yarbing") provides off-season income for some persons. The tourist business is substantial.

Lees-McRae College and Grandfather Orphanage are located at Banner Elk. There is a noted mountain-school at Crossnore.

Communities include Newland (county seat), Linville, Elk Park, Spear, Banner Elk, Cranberry, Heaton, Crossnore, Pineola and Altamount.

Rainfall (inches)	47.62
Snowfall (inches)	39.0
Mean annual temperature (degrees)	50.5
Growing season (days)	148
Tobacco (1951 Val.)	$119,390
Irish and Sweet Potatoes (1951 Val.)	$193,950
Corn (1951 Val.)	$128,630
Total Land Area (acres)	158,080
Forest Area (acres)	99,400
Population (1940)	13,561
Population (1950)	13,352
Total Tax Val.	$5,914,936
Tax Rate	$1.98

Watauga County - This county was formed, in 1849, from Ashe, Wilkes, Caldwell, and Yancey Counties. It was named after an Indian tribe. Sections of Watauga and Ashe Counties were once included in a community called the Watauga Settlements. This region was under the jurisdiction of the State. From 1772 to 1778, the settlers were organized as the Watauga Association, a little republic with its own constitution. Moravians, seeking a site for their settlements, scouted the county in 1752 and, in 1760, Daniel Boone explored the area.

A northwest North Carolina county, Watauga lies on a high plateau between the Blue Ridge and a range of the Great Smoky Mountains and is bordered by Tennessee on the west. Although averaging around 3,000 feet in altitude, much of Watauga County is unlike its more rugged neighbors. Most of its hills rise to rolling tops, and there are few rock-outcrops. While there has been no development of minerals, asbestos is found, on Rich Mountain, northwest of Boone. There are also copper, feldspar, soapstone, and iron deposits. Forests include dead chestnut, oak, maple, pine, and poplar. Waters include Watauga River and South Fork New River, and Beaverdam, Cove, Beech, Laurel, Howard, Meat Camp, and smaller creeks.

In order of their cash value, crops in Watauga County are vegetables, Irish and sweet potatoes, corn, and hay. Burley tobacco has become increasingly important. Lumbering and sawmill operations are conducted. Industrial activity is small and largely confined to these raw materials. A burley-tobacco market has been established at Boone. The tourist industry is of considerable importance, particularly at Boone and Blowing Rock. The latter community, which is partly in Caldwell County, is one of the oldest resorts in the southern Appalachians and is the only incorporated town directly on the Blue Ridge Parkway. A large number of cottagers spend the hot summer-months there. The Blue Ridge Parkway, crossing the southeastern portion of the county, is expected to increase greatly the value of the tourist industry. There are also some children's summer camps in the county.

Appalachian State Teachers College (co-educational), at Boone, is one of the largest institutions in western North Carolina. It is State-operated and includes a demonstration course and a four-year college course.

Points of interest include Blue Ridge Parkway, rhododendron and laurel gardens, Watauga Industries' handicraft school and shop at Boone, the Cone Estate at Boone which has miles of graded trails for riding and hiking, the Blowing Rock which is a monolith jutting over Johns River Valley, and a painting by Elliott Daingerfield, entitled "The Madonna of the Hills", which hangs in St. Mary's of the Hills at Blowing Rock.

Communities include Boone (county seat), Blowing Rock, Sugar Grove, Deep Gap, Meat Camp, Sherwood, Zionville, and Valle Crucis.

Rainfall (inches)	54.42	Population (1940)	18,114
Snowfall (inches)	24.5	Population (1950)	18,342
Mean annual temperature (degrees)	51.6	Total Tax Val.	$21,266,585
Growing season (days)	158	Tax Rate	$ .80
Vegetables (1952 Val.)	$650,000		
Irish and Sweet Potatoes (1952 Val.)	$380,000		
Hay (1952 Val.)	$260,000		
Total Land Area (acres)	204,800		
Forest Area (acres)	95,000		

Watershed Boundaries - The boundary line of the area covered by the Kanawha and Watauga River Basins, in a clockwise direction, extends generally as follows:

Beginning at the intersection of the North Carolina-Tennessee State line with the Virginia-Tennessee State line;

Thence, along the Virginia-North Carolina State line, to the northeast corner of Alleghany County;

Thence, between the Blue Ridge Parkway and the Alleghany-Surry County line, through Rich Hill (Elev. 3260) and Mountain View Church to the Alleghany County road between Roaring Gap and Cherry Lane;

Thence, along latitude 36°25', to the Alleghany-Surry County line;

Thence, along the Alleghany-Surry County line, the Alleghany-Wilkes County line, and the Ashe-Wilkes County line, to Thompkins Knob where the Ashe-Watauga, Ashe-Wilkes, and Watauga-Wilkes County lines come together;

Thence, along the Watauga-Wilkes County line, the ridge between Gap Creek and Stony Fork Creek, the ridge between South Fork New River and Elk Creek (tributary of Yadkin River), and the ridge between East Fork of South Fork New River and Laurel Fork of Elk Creek (tributary of Yadkin River) to Dugger Mountain;

Thence, through Sampson Mountain, Blowing Rock, and Coffey's Gap, to Grandfather Mountain;

Thence, through Linville Gap, Hickory Nut Gap, Smokey Gap, Cranberry Gap, and Hump Gap, to Little Hump Mountain on the North Carolina-Tennessee State line; and

Thence, along the North Carolina-Tennessee State line to the point of beginning.

The Boundary between the Kanawha River Basin and the Watauga River Basin extends as follows:

Beginning at a point on the North Carolina-Tennessee State line near Zionville, Watauga County;

Thence, southeast and south in Watauga County, through Rich Mountain (Elev. 5369) and Sugarloaf Mountain (Elev. 4705), to the junction of U. S. Highway 421 and 221; and

Thence, south along U. S. Highway 221 to Coffey's Gap on the Watauga-Caldwell County line.

Streams of the Kanawha and Watauga River Basins - There follows a list, alphabetically arranged, of streams in the two basins in North Carolina, the names of which are shown on available maps. There are numerous streams on such maps, the names of which are not indicated. There are shown, on the following list, the stream into which each of the streams, alphabetically arranged flows, and also the county in which the junction is located. It is believed that this list will be helpful to interested persons in quickly locating, on a county, topographical, or other map, any stream included in the list and also to trace the course of the stream throughout the basin.

KANAWHA RIVER BASIN

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Bear Creek	South Fork New River	Ashe
Beaver Creek	South Fork New River	Ashe
Ben Bolen Creek	Three Top Creek	Ashe
Big Horse Creek	North Fork New River	Ashe
Big Pine Creek	Brush Creek	Alleghany
Boone Creek	Flannery Fk. South Fk. New River	Watauga
Brush Creek	Little River	Alleghany
Buffalo Creek	North Fork New River	Ashe
Crab Creek	Little River	Alleghany
Cranberry Creek	South Fork New River	Ashe
Deep Gap Creek	South Fork New River	Ashe
Dog Creek	South Fork New River	Ashe
East Fork	South Fork New River	Watauga
Elk Creek	New River	Alleghany
Elk Creek	South Fork New River	Ashe-Watauga
Flannery Fork	South Fork New River	Watauga
Fork Creek	Mulberry Creek	Alleghany
Glade Creek	Little River	Alleghany
Grassy Branch	South Fork New River	Watauga
Grassy Creek	North Fork New River	Ashe
Helton Creek	North Fork New River	Ashe
Horse Creek	North Fork New River	Ashe
Hoskin Fork	North Fork New River	Ashe
Howard Creek	South Fork New River	Watauga
Jewell Branch	Little River	Alleghany
Laurel Branch	Brush Creek	Alleghany
Laurel Creek	New Fork New River	Ashe
Laurel Fork	Mulberry Creek	Ashe
Little Glade Creek	Brush Creek	Alleghany
Little Horse Creek	South Fork Big Horse Creek	Ashe
Little Pine Creek	Brush Creek	Alleghany
Little River	New River	Ashe
Long Hope Creek	Three Top Creek	Ashe
Meadow Fork Creek	Cranberry Creek	Ashe
Meat Camp Creek	South Fork New River	Watauga
Middle Fork	South Fork New River	Watauga
Mill Creek	South Fork New River	Watauga
Moccasin Creek	Little River	Alleghany
Mulberry Creek	Cranberry Creek	Ashe
Naked Creek	South Fork New River	Ashe
New River	Kanawha River	Kanawha (W.Va.)
North Fork	New River	Ashe
Obids Creek	South Fork New River	Ashe
Old Field Creek	South Fork New River	Ashe
Payne Branch	Middle Fork of S. Fk. New River	Watauga
Peak Creek	South Fork New River	Ashe
Pine Swamp Creek	Little River	Alleghany
Piney Fork Creek	Mulberry Creek	Alleghany
Rich Hill Creek	North Fork New River	Ashe
Riddles Fork	Meat Camp Creek	Watauga
Roan Creek	South Fork New River	Ashe
Rock Creek	New River	Alleghany
Rock Creek	North Fork New River	Ashe

STREAM	RECEIVING STREAM	COUNTY IN WHICH JUNCTION OCCURS
Roundabout Creek	North Fork New River	Ashe
Silas Creek	North Fork New River	Ashe
South Fork	Big Horse Creek	Ashe
South Fork	New River	Ashe-Alleghany
Stagg Creek	North Fork New River	Ashe
Sugar Tree Branch	North Fork New River	Ashe
Three Top Creek	North Fork New River	Ashe
Winklers Creek	Flannery Fk. of S. Fk. New River	Watauga

WATAUGA RIVER BASIN

Banner Elk Creek	Elk River	Avery
Beaverdam Creek	Watauga River	Watauga
Beech Creek	Buckeye Creek	Watauga
Boone Fork	Watauga River	Watauga
Brushy Fork	Watauga River	Watauga
Buckeye Creek	Watauga River	Avery-Watauga
Clarks Creek	Crab Orchard Creek	Watauga
Cove Creek	Brushy Fork of Watauga River	Watauga
Crab Orchard Creek	Watauga River	Watauga
Dutch Creek	Crab Orchard Creek	Watauga
Elk River	Watauga River	Carter (Tenn.)
Little Elk Creek	Elk River	Avery
North Fork Creek	Cove Creek	Watauga
Pick Breeches Creek	Rubes Creek	Watauga
Rubes Creek	Beaverdam Creek	Watauga
Shawneeshaw Creek	Elk River	Avery
Watauga River	Holston River	Sullivan-Washington (Tenn.)

CHAPTER II - USE OF WATER FOR DOMESTIC AND MUNICIPAL PURPOSES

"Descriptions and Chemical Character of Public Surface-Water Supplies in North Carolina, 1947", and "Descriptions and Chemical Character of Public Ground-Water Supplies in North Carolina, 1949", prepared by the Geological Survey, U. S. Department of the Interior, in cooperation with the North Carolina State Board of Health, contain the following information regarding public water-supplies in the Kanawha and Watauga River Basins. Ownership is municipal unless otherwise indicated.

Blowing Rock, Caldwell-Watauga Counties

Population - 1940: 654 (1950:661)
Supplies also about 40 people outside of city limits.
Sources - Small streams at foot of Flat Top Mountain on Cane Estate.
Treatment - Coagulation with alum and lime, chlorine, rapid sand filtration, chlorine, ammonia, final adjustment of pH with lime.
Sample collected - September 26, 1946.

Color	2		
pH	7.6	Bicarbonate	12
Silica	6.9	Sulfate	6.2
Iron	0.03	Chloride	1.2
Manganese	0.0	Fluoride	0.1
Calcium	4.5	Nitrate	0.2
Magnesium	0.4	Dissolved solids	29
Na + K	2.5	Total hardness	13

Boone, Watauga County

Population - 1940:1,788 (1950:2,973)
Supplies also about 20 people outside of city limits.
Source: Winklers Creek.
Treatment: Chlorine.
Sample Collected - August 6, 1946.

Color	12	Bicarbonate	9.0
pH	7.6	Sulfate	1.1
Silica	6.8	Chloride	1.0
Iron	0.08	Fluoride	0.1
Calcium	1.5	Nitrate	0.2
Magnesium	0.5	Dissolved solids	20
Na + K	2.1	Total hardness	6

Banner Elk, Avery County

Population -1940:344 (1950:462)
Ownership - Edgar Tufts Memorial Association

Sources	Well 1	Well 2	Well 3
Depth of well (ft.)	173	204	115
Diam. of well (in.)	8	8	5.6
Yield (g.p.m.)	50	50	50
Samples collected	6-24-48	6-24-48	8-30-48
Treatment	none	none	none
Color	2	2	2
pH	6.8	6.8	6.4
Silica	20	18	19
Iron	0.10	0.09	0.35
Calcium	10	11	4.0
Magnesium	6.0	5.1	3.4

Banner Elk (continued)	Well 1	Well 2	Well 3
Na + K	3.4	2.6	3.9
Bicarbonate	62	56	26
Sulfate	1.6	1.9	0.5
Chloride	1.9	1.5	2.0
Fluoride	0.0	0.0	0.1
Nitrate	2.2	5.0	9.4
Dissolved solids	76	76	56
Total hardness	50	56	24

Elk Park, Avery County

Population - 1940:467 (1950:545)
Source - Cooks Spring
Sample collected - Nov. 13, 1946
Treatment - None

Color -	3	Bicarbonate	13
pH	6.5	Sulfate	1.7
Silica	10	Chloride	0.9
Iron	0.05	Fluoride	0.1
Calcium	3.1	Nitrate	3.8
Magnesium	1.1	Dissolved solids	30
Na + K	2.2	Total hardness	12

Jefferson, Ashe County

Population - 1940: 304 (1950:359)
Source - Stanley Spring (50%) and Scott Spring (50%)
Sample collected - Nov. 21, 1946
Treatment - None

Color	7.0	Bicarbonate	21
pH	6.3	Sulfate	1.3
Silica	14	Chloride	0.9
Iron	0.05	Floride	0.1
Calcium	3.2	Nitrate	2.1
Magnesium	1.4	Dissolved solids	38
Na + K	3.7	Total hardness	14

Lansing, Ashe County

Population - 1940:274 (1950: not available)
Ownership - M. M. Weaver
Sources - 10 springs impounded in Lansing High School Reservoir
Sample collected - Nov. 11, 1946
Treatment - None

Color	2	Bicarbonate	24
pH	6.3	Sulfate	1.4
Silica	17	Chloride	0.8
Iron	0.01	Fluoride	0.2
Calcium	3.8	Nitrate	0.6
Magnesium	1.5	Dissolved solids	40
Na + K	3.5	Total hardness	16

Roaring Gap, Alleghany County

Population - 1940:24(1950: not available)

Sources	Well 1	Well 2
Depth of well (ft.)	150	156

Roaring Gap (continued)

	Well 1	Well 2			
Diam. of well (in.)	8	10	Na + K	1.7	1.7
Yield (g.p.m.)	110	110	Bicarbonate	6	7
Samples collected	7-29-49	7-29-49	Sulfate	0.9	1.2
Treatment	None	None	Chloride	1.2	0.8
Color	3	2	Nitrate	2.5	0.1
pH	5.6	5.8	Dissolved solids	18	14
Silica	6.2	6.6	Total hardness	6	5
Iron	0.13	0.07			
Calcium	1.2	1.0			
Magnesium	0.7	0.5			

Sparta, Alleghany County

Population - 1940:648 (1950:820)

Sources	Well 1	Well 2	Magnesium	1.0	0.9
Depth of well (ft.)	392	282	Na + K	4.9	5.2
Diam. of well (in.)	6	8	Bicarbonate	30	35
Yield (g.p.m.)	15	42	Sulfate	3.0	2.8
Samples collected	6-27-47	6-27-47	Chloride	0.9	1.0
Treatment	none	none	Fluoride	0.3	0.4
Color	3	6	Dissolved solids	47	50
pH	6.0	6.3	Total hardness	19	23
Silica	14	14			
Iron	0.14	0.13			
Calcium	6.0	7.6			

Warrensville, Ashe County

Population - 1940:150 (1950:120)
Ownership - Mrs. Claudia Johnson
Source - Spring

Sample collected	1-18-47		
Treatment	none		
Color	5	Bicarbonate	26
pH	6.5	Sulfate	3.5
Silica	15	Chloride	1.5
Iron	0.05	Fluoride	0.1
Calcium	5.5	Nitrate	4.2
Magnesium	2.6	Dissolved solids	48
Na + K	2.9	Total hardness	24

West Jefferson, Ashe County

Population - 1940:883 (1950:871)

Sources	Spring	Well			
Samples collected	9-22-49	9-22-49 (mixed sample from spring and well)	Na + K	1.6	1.2
			Bicarbonate	15	14
			Sulfate	1.6	1.6
			Chloride	0.8	0.8
Treatment	None	None	Fluoride	0.1	0.0
Color	2	1	Nitrate	0.4	0.4
pH	6.5	6.4	Dissolved solids	26	26
Silica	11	11	Total hardness	12	12
Iron	0.02	0.06			
Calcium	2.6	2.6			
Magnesium	1.4	1.3			

"Bulletin No. 47, Progress Report on Ground Water in North Carolina by M. J. Mundorff, 1945", prepared in cooperation with the Geological Survey, U. S. Department of the Interior and published by the North Carolina Department of Conservation and Development, contains information regarding wells in the Kanawha and Watauga River Basins, used for the purpose of supplying water to municipalities, as follows:

Newland, Avery County

Location - 0.5 mile northwest of Newland
Depth of well (feet) 150
Diameter (inches) 6
Topographic location - Slope
Chief Aquifer - Shale (Cambrian?)
Yield (gallons per minute) - 60
Remarks - Near base of hill.

CHAPTER III - USE OF WATER FOR AGRICULTURE

General - As indicated in Chapter I of this publication, the chief agricultural pursuits of Kanawha and Watauga River Basins are stock raising and growing a variety of agricultural products. It may be stated that the principal occupation of the inhabitants of these two basins is the raising of livestock and agricultural products.

Data regarding Agricultural Production - Information regarding farm population, total land in farms, harvested croplands, idle cropland, use of fertilizer, and agricultural products for the counties lying wholly or partially within the Kanawha and Watauga River Basins, according to the 1952 Farm Census of 1951 crops, is shown below. The figures are in acres, unless otherwise indicated.

Item	Alleghany County	Ashe County	Avery County	Watauga County	Total
Harvested Cropland	20,818	34,915	14,221	21,338	91,292
Idle Cropland	1,189	4,566	2,818	8,231	16,804
Pasture	69,840	129,093	24,273	58,567	281,773
Woods, Home-Sites, etc.	40,701	93,010	48,844	72,826	255,381
Corn Harvested	3,927	7,861	1,747	4,208	17,743
Cotton Harvested	- -	- -	- -	- -	- -
Tobacco Harvested	217	1,062	111	902	2,292
Peanuts	- -	- -	- -	- -	- -
Wheat	237	131	47	177	592
Oats	457	1,285	564	1,274	3,580
Other Small grains	207	293	290	517	1,307
Soybeans	1	4	10	12	27
Lespedeza	13	- -	- -	- -	13
Hay Crops Harvested	951	1,413	352	711	3,427
Other Hays Cut	13,535	19,923	8,163	10,150	51,771
Irish Potatoes	170	433	884	1,140	2,627
Sweet Potatoes	12	14	23	13	62
Other Vegetables Grown	103	1,505	999	1,148	3,755
Other Crops Harvested	1,050	1,695	1,226	1,585	5,556
Total Land in Farms	132,553	261,584	90,156	160,962	645,255
Total Land Area	147,200	273,280	150,080	204,800	775,360
Comm. Fert. Used, Tons	4,701	7,883	2,231	4,965	19,780
Sows and Gilts, No.	248	311	107	190	856
Cows and Heifers, No.	9,312	13,991	3,342	7,522	34,167
Hens and Pullets, No.	28,479	71,298	22,677	45,131	167,585
Tractors in usable condition, No.	167	122	37	62	388
Farm Population, No.	5,696	15,556	7,745	10,983	39,980
Total Population, 1950, No.	8,155	21,878	13,352	18,342	61,727

Permits to Use Water for Irrigation - The following permits to use surface water in the Kanawha and Watauga River Basins, have been issued by the Director of the Department of Conservation and Development in accordance with the provisions of Section 113-8.1, General Statutes of North Carolina, as amended.

Alleghany County

Permit No.	Name	Address	Source	Amount (c.f.s.)
633	F. A. Stoker	Glade Valley	Br. Little Glade Cr.	0.47
632	F. A. Stoker	Glade Valley	Big Glade Creek	0.47

Ashe County

Permit No.	Name	Address	Source	Amount (c.f.s.)
116	F. N. Colvard	Jefferson	S.Fk. New River	2.80
117	F. N. Colvard	Jefferson	Big Naked Cr.	1.69
118	F. N. Colvard	Jefferson	Obids Creek	1.69
219	Claude Bowirs	Jefferson	Cup Branch	0.10
246	W. E. Vannoy	W. Jefferson	Naked Creek	1.18
247	M. H. Dollars & R. M. Blevins	W. Jefferson	Little Buffalo Cr.	1.04
612	J.T. & R.B.Brown	R#1, Todd	S. Fk. New River	0.62
783	Upper Mountain Research Sta.	Laurel Springs	Peak Creek	0.70

Avery County

None

Watauga County

277	Valle Crucis Mission Farm	Valle Crucis	Dutch Creek	0.64

CHAPTER IV - USE OF WATER FOR RECREATION

"North Carolina Almanac, 1954-55", published by The Almanac Company, Raleigh, North Carolina, contains the following information regarding recreation facilities and use of water for recreation in the four counties lying wholly or partially within the Kanawha and Watauga River Basins:

Alleghany County - Recreational facilities include Blue Ridge Parkway along the eastern boundary of the county; Cumberland Knob Park, a recreational area on the Parkway in the northeastern corner of the county, which provides picnicking, hiking, and refreshment facilities; hotels, cottages, lake, golf, and riding at Roaring Gap on U. S. Highway 21, in the southeastern corner of the county about four miles southeast of the Parkway; and Summer Girl's Camp at Big Lake near Roaring Gap.

Trout and small-mouth bass are found in Little River and Piney Creek. There are other fishing streams.

Ashe County - The Blue Ridge Parkway extends 25 miles along the western side of the county. Vacationists find the high altitude, climate, and scenery ideal. There are some resort facilities, mostly based on motoring and hiking.

Trout and small-mouth bass are found in the North and South Forks of New River. Trout are also caught in Big Helton Creek.

Avery County - There are resort developments at Linville and Banner Elk. The Blue Ridge Parkway skirts the eastern boundary of the county. Golf, riding, swimming, tennis, and trout fishing are available at Linville (summer), and these vacational pursuits, except golf, are enjoyed at Banner Elk. Students at Lee's-McRae College in Banner Elk ski in winter. On the fourth Sunday in June, every year, the "Tri-State Mountain-Singing Convention" is held at Grandfather Mountain, with as many as 20,000 attending.

The Boone Wildlife Management Area, a 44,000-acre preserve in the southeastern corner of the county, is stocked with deer and trout. Bear-hunting is available.

Watauga County - At Blowing Rock, a mountain resort on U. S. Highways 221 and 321 which is partly in Watauga County and partly in Caldwell County, golfing, hiking, tennis, riding, fishing, etc., are available. Horse shows are conducted in August. Camps for boys and girls are located at Blowing Rock and other places.

Fish are found as follows: Small mouth bass, brown trout, and rainbow trout in the upper part of Watauga River; brook trout and brown trout in Meat Camp Creek; and brook trout, rainbow trout, and brown trout in Howard Creek.

Volumes in the series of hydrologic data on North Carolina river basins, published by the North Carolina Department of Conservation and Development in cooperation with the Geological Survey, U. S. Department of the Interior, do not include hydrologic data on the Kanawha and Watauga River Basins. Hydrologic data, pertaining to South Fork New River near Jefferson, South Fork New River near Crumpler, North Fork New River near Warrensville, and North Fork New River at Crumpler, may be found in "Geological Survey Water Supply Paper 1275" published in 1955.

Records of the North Carolina Department of Conservation and Development, pertaining to streams in the two basins and prepared from data provided by the Geological Survey, are set forth below.

North Fork New River (Kanawha River Basin) at Crumpler, Ashe County

Location - Lat. 36°31', long. 81°23', on left bank 0.25 mile downstream from bridge on State Highway 16 at Crumpler, 6 miles upstream from mouth, and 7.5 miles northeast of Jefferson.

Drainage area - 277 square miles.

Records available - August 1900 to December 1901 (fragmentary), August 1908 to September 1916 (gage heights only), and July 1928 to September 1953 in reports of Geological Survey. August 1908 to September 1916 in Bulletin 34 of North Carolina Department of Conservation and Development. Published as "at Weaversford" 1900-1901, as "near Crumpler" 1908-16. Records available in Raleigh offices of the Geological Survey and Department of Conservation and Development, October 1953 to date.

Gage - Water-stage recorder. Datum of gage is 2,518.81 feet above mean sea level, unadjusted. Prior to Sept. 30, 1916, staff or chain gages at sites from 0.5 mile to 1.5 miles upstream from mouth at various datums. July 11, 1928 to Nov. 5, 1930, chain gage at bridge 0.25 mile upstream at different datum.

Average discharge - 33 years (1908-16, 1928-53), 472 c.f.s.

Extremes - Maximum discharge, 73,000 c.f.s. (revised) Aug. 14, 1940 (gage height: 23.0 feet from floodmarks), from rating curve extended above 3,400 c.f.s. on basis of slope-area determinations of peak flow at gage heights 10.72 and 23.0 feet.

Minimum discharge, 38 c.f.s., Sept. 19, 1932.
Minimum daily discharge, 53 c.f.s., Sept. 19, 1932.

Remarks - Records good except those for periods of ice effect, which are poor. Some diurnal fluctuation at low flow caused by powerplant above station.

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	345	318	318	300	392	337	252	219	234	211	260	285
Mean monthly discharge, c.f.s.	551	493	492	465	607	522	390	339	363	326	403	441
Maximum mean weekly discharge, m.g.d.	1660	1536	1490	1160	1390	1540	2390	814	982	982	1290	1180
Maximum mean weekly discharge, c.f.s.	2570	2377	2300	1799	2145	2390	3700	1260	1520	1520	2000	1820

N. Fk. New River at Crumpler (continued)

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Minimum mean weekly discharge, m.g.d.	127	99	99	83	156	136	67	56	51	39	63	67
Minimum mean weekly discharge, c.f.s.	196	153	153	128	242	211	104	87	74	61	97	104
Maximum daily discharge, m.g.d.	5170	4510	3790	2250	3400	4720	1920	1730	2700	2590	3200	4000
Maximum daily discharge, c.f.s.	8000	6980	5860	3480	5270	7310	2970	2680	4180	4010	4960	6190
Minimum daily discharge, m.g.d.	114	90	81	78	133	84	65	47	43	34	59	58
Minimum daily discharge, c.f.s.	176	140	126	120	206	130	100	72	66	53	92	90

South Fork New River (Kanawha River Basin) near Jefferson, Ashe County

Location - Lat. 36°24', long. 81°25', on right bank 600 feet upstream from bridge on State Highways 16 and 88, 0.25 mile downstream from Bear Creek, and 4 miles southeast of Jefferson.

Drainage area - 207 square miles.

Records available - October 1924 to September 1926, July 1928 to date.

Gage - Water-stage recorder. Datum of gage is 2,657.04 feet above mean sea level, unadjusted. Prior to Oct. 14, 1934, chain gage on old bridge 400 feet (revised) downstream at same datum. Oct. 14, 1934 to Mar. 25, 1935, staff gage at present site and datum.

Average discharge - 26 years (1925-26, 1928-53); 419 c.f.s.

Extremes

Maximum discharge - 52,800 c.f.s. on Aug. 14, 1940 (gage height -22.50 feet), from rating curve extended above 5,100 c.f.s. on basis of slope-area determination of peak flow.

Minimum discharge - 52 c.f.s. (revised) on Dec. 24, 1943, result of freeze up.

Minimum daily discharge - 65 c.f.s. on Sept. 9, 1925.

Maximum stage known prior to 1924 - 18.0 feet on July 15, 1916, from floodmarks as witnessed by local resident (discharge - 35,200 c.f.s.)

Remarks - Records good except those for period of no gage-height record, which are poor.

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	323	271	260	290	427	309	227	208	224	172	205	183
Mean monthly discharge, c.f.s.	500	419	402	449	661	479	352	322	347	267	318	284
Maximum mean weekly discharge, m.g.d.	1710	1090	827	629	1420	1200	652	562	866	607	659	530
Maximum mean weekly discharge, c.f.s.	2640	1680	1280	1110	2200	1860	1010	870	1340	939	1020	821
Minimum mean weekly discharge, m.g.d.	152	98	103	137	230	162	81	89	72	56	77	61
Minimum mean weekly discharge, c.f.s.	236	151	159	220	338	251	126	131	111	87	119	94
Maximum daily discharge, m.g.d.	4840	2240	2100	1560	3530	2710	1160	2100	2110	1960	2160	1150

S. Fk. New River near Jefferson (continued)

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Maximum daily discharge, c.f.s.	7490	3470	3250	2420	5470	4200	1800	3250	3270	3030	3340	1780
Minimum daily discharge, m.g.d.	115	99	96	110	205	149	79	80	65	52	65	58
Minimum daily discharge, c.f.s.	178	154	148	170	318	230	123	124	101	80	100	90

Elk River (Watauga River Basin) near Elk Park, Avery County

Location - Lat. 36°11'01", long. 81°57'45", 1.4 miles downstream from Little Elk Creek, 2 miles northeast of Elk Park, and 3 miles upstream from North Carolina-Tennessee State line.

Drainage area - 42.0 square miles.

Records available - Oct. 1, 1934 to September 30, 1955, at which time the station was discontinued.

Gage - Au Continuous Recorder.

Extremes
Maximum stage - 17.8 feet, from floodmarks, on Aug. 13, 1940 (27,500 c.f.s.).
Minimum stage - 0.78 feet on Dec. 15, 1939, at former site on left bank (4 c.f.s.).
Minimum stage recorded at present site, 1.42 feet on Oct. 9, 1943 (11 c.f.s.)

Remarks - Slight diurnal fluctuation at low flow caused by power plant above station.

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954
Mean monthly discharge, m.g.d.	62.1	49.5	62.9	48.9	72.4	57.0	41.3	37.0	41.3	42.9
Mean monthly discharge, c.f.s.	96.1	76.1	97.3	75.7	112	88.3	63.9	57.2	63.9	66.4
Maximum mean weekly discharge, m.g.d.	224	263	305	209	278	339	182	197	233	263
Maximum mean weekly discharge, c.f.s.	346	407	472	324	431	524	281	305	360	407
Minimum mean weekly discharge, m.g.d.	14	8.4	17	13	23	20	6.5	6.4	5.9	4.3
Minimum mean weekly discharge, c.f.s.	22	13	26	20	36	31	10	9.9	9.2	6.7
Maximum daily discharge, m.g.d.	536	704	911	389	866	1180	443	519	665	879
Maximum daily discharge, c.f.s.	830	1090	1410	602	1340	1830	685	803	1030	1360
Minimum daily discharge, m.g.d.	12	8.4	15	12	19	17	5.8	5.8	4.9	3.9
Minimum daily discharge, c.f.s.	18	13	23	18	29	27	9.0	9.0	7.6	6.1

Watauga River near Sugar Grove, Watauga County

Location - Water-stage recorder, lat. 36°14'18", long. 81°49'22", 150 feet upstream from State Highway 603, 300 feet from Cove Creek, and 2.5 miles southwest of Sugar Grove.

Drainage area - 90.8 square miles.

Records available - May 17, 1940 to date.

Maximum stage - 29.6 feet, from profile based on floodmarks, Aug. 13, 1940 (discharge, 50,800 c.f.s.). Flood of July 1916 reached a stage of 22.1 feet, from floodmarks 0.25 mile upstream as witnessed by local resident (discharge, 28,000 c.f.s.).

Minimum stage - 1.21 feet on Feb. 20, 1941 (discharge, 12 c.f.s.).

Remarks - Slight diurnal fluctuation at low flow caused by operation of grist mill above station. Ice effect for short periods during protracted cold.

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956
Mean monthly discharge, m.g.d.	121	96.3	109	123	155	123	76.9	73.6	87.2	75.6	90	76
Mean monthly discharge, c.f.s.	188	149	169	190	240	190	119	114	135	117	139	117
Maximum mean weekly discharge, m.g.d.	646	521	466	395	514	885	395	332	425	418	547	383
Maximum mean weekly discharge, c.f.s.	1000	806	722	612	795	1370	612	514	658	647	847	593
Minimum mean weekly discharge, m.g.d.	31	20	30	34	59	41	12	9.6	12	9.7	20	11
Minimum mean weekly discharge, c.f.s.	48	31	46	53	92	63	18	15	18	15	31	17
Maximum daily discharge, m.g.d.	1760	1330	1410	1170	1460	3310	859	1120	1350	1390	2180	1270
Maximum daily discharge, c.f.s.	2720	2060	2190	1810	2260	5120	1330	1730	2090	2150	3370	1970
Minimum daily discharge, m.g.d.	25	18	25	30	49	35	11	14	10	8.4	19	10
Minimum daily discharge, c.f.s.	39	28	39	46	76	54	17	21	16	13	30	16

Watauga River at North Carolina-Tennessee State Line, Avery-Watauga Counties

Description of gaging station is not available. It was discontinued on September 30, 1953.

	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952
Maximum daily discharge, m.g.d.	1050	1690	2290	2070	2030	1380	1790	3600	1140	1340
Maximum daily discharge, c.f.s.	1620	2620	3550	3200	3140	2130	2770	5580	1760	2080
Mean daily discharge, m.g.d.	146	141	194	157	171	187	237	203	140	123
Mean daily discharge, c.f.s.	226	218	301	243	265	289	367	315	217	191
Minimum daily discharge, m.g.d.	21	15	39	21	9.7	40	67	48	18	12
Minimum daily discharge, c.f.s.	33	23	60	33	15	62	103	74	28	18
Maximum mean weekly discharge, m.g.d.	483	579	827	827	665	691	775	1180	571	594
Maximum mean weekly discharge, c.f.s.	748	897	1280	1280	1030	1070	1200	1800	884	919
Minimum mean weekly discharge, m.g.d.	23	21	52	31	50	50	84	57	21	16
Minimum mean weekly discharge, c.f.s.	36	32	80	48	78	78	130	88	32	24

CHAPTER VI - GROUND WATER

General - Ground water is one of the most valuable natural resources in North Carolina. Approximately 2,500,000 people, or 70 percent of the total population of the State (1945), depend upon ground water for their water supply. Probably more than 99 percent of the rural population use water from wells or springs, and approximately 400,000 people are supplied with ground water by municipalities and military establishments. The total population of the State in 1950 was 4,061,929, and the total population of the State, living on farms, in 1951 was 1,457,428. Based on these figures, approximately 54 percent and 46 percent of the people of the State are supplied with surface water and ground water, respectively.

Of the several million dollars a year spent in obtaining ground water for the people, a considerable part is spent in digging, boring, and drilling new wells. It is unfortunate that part of this money is used unnecessarily because of inadequate knowledge of the ground-water conditions.

Geology and its relation to ground water - There is a very close relationship between the geology of an area and the quantity and quality of water that can be obtained from wells in the area. Therefore, an understanding of the fundamentals of geology and the principles of the occurrence of ground water are of great value in estimating the ground-water possibilities of a locality and in choosing the best possible location for drilling.

The principal source of ground water is precipitation as rain or snow. The water can enter and move, through the soil and unconsolidated rocks, only through the openings between the sand grains and clay particles, and can enter and move, in harder-consolidated rocks, only through fractures and joints. Ground water moves because of gravity, and the point of its discharge from the ground is always at a lower level than the point at which it entered. Entry occurs in areas between streams, and the natural discharge is into streams, swamps, and the sea. Rain, falling on the surface of the ground, percolates vertically downward through the earth until it reaches the zone of saturation below which the pores and openings of the rock are completely filled with water. The upper surface of the zone of saturation is called the water table and, in North Carolina, generally is from a few feet to about 100 feet below the land surface. Discharge of ground water is a continuous process so that the ground-water levels are receding except during and immediately following a period of rainfall at which time the ground-water supplies are replenished. For these reasons, the water table is not a fixed surface but is continually fluctuating.

The amount of water in an aquifer depends upon the porosity of the rock. Porosity is defined as that percentage of the total volume of the rock that is occupied by pores or other openings. Natural rock-materials differ greatly in porosity. The porosity of unconsolidated materials, such as sand, clay, and gravel, commonly is from 25 to 50 percent. The porosity of consolidated rocks is much less and is mainly in the joints, fractures, and solution channels.

A rock may have a large porosity and yet yield little water, even though allowed to drain for a long time. A clay, for example, with a porosity of 50 percent, might not yield any water because of the smallness of the pores, the water being retained because of molecular attraction. The ratio of the volume of water a saturated rock will yield by gravity to the total volume of rock is called the specific yield and is stated as a percentage.

Porosity and specific yield are important properties of an aquifer. Permeability, the rate at which the water can be transmitted through a rock, is, however, its most important water-yielding characteristic. The permeability of an aquifer depends upon the size and arrangement of its pores. In clays, the pores are so small that water will be transmitted very slowly through the clays. A clean sand of moderate texture will transmit, and therefore yield, water relatively rapidly.

In rocks such as granite, slate, schist, gneiss, and some sandstone and shale, water moves along bedding planes, joints, and cleavage planes so that the amount of water, which such rocks will yield, depends on the size and number of these openings.

As rain is practically free of mineral matter, the mineral content of ground water depends on the minerals which are dissolved as the water percolates through the rock. Therefore, the mineral content of water is largely determined by the kind of rock through which it moves and by the length of time it is in contact with soil and rock.

Geology and Ground Water in the Mountain Section of North Carolina including the Kanawha and Watauga River Basins - Little detailed information is available regarding ground-water supplies and conditions in the Mountain section of the State. Surface supplies generally have been satisfactory in this area. Ground water, however, has the advantage of a constant supply and temperature, so that it is preferred at many places.

The rocks of the Mountain section have been divided into three main unit-areas on the basis of their hydrologic properties.

The first unit-area includes a small part of the eastern portion of Alleghany County, the southwestern corner of Watauga County, and the central part of Avery County. Rocks include schists, phyllites, slates, shales, quartzites, sandstones, limestones, and marbles. They are chiefly derived from sedimentary formations, usually have distinct bedding-planes, and are of Pre-Cambrian and Cambrian age.

The rocks of the first unit-area generally yield moderate supplies of water comprising from 5 to 50 or more gallons a minute. The harder and coarser-grained formations generally yield larger supplies than those of softer and finer grain. Because a considerable amount of the water moves along the bedding and cleavage planes, the most-productive wells are in areas where these planes are only moderately tilted. The water is usually soft, except from wells in limestone.

The second unit-area includes the southwestern part of Avery County, the eastern part of Ashe County, most of Alleghany County, and the northeastern Corner of Watauga County. Rocks include gneiss and schist, chiefly feldspar-biotite gneiss and schist included in the Carolina gneiss. They are derived from sedimentary rocks and ore of Pre-Cambrian age.

The rocks of the second unit-area yield large amounts of water from wells 100 to 400 feet deep. Best supplies are obtained in coarser phases where dip is fairly low. The water is soft to moderately hard. Some of the best aquifers are the highly-metamorphosed and sheared rocks included in the Carolina gneiss.

The third-unit area includes the northwestern part, and a small portion of the eastern part, of Avery County; most of Watauga County; and the western part of Ashe County. Rocks comprise granites and gneisses with slight to severe metamorphism,

Cranberry granite, Henderson granite, Blowing Rock gneiss, Bessemer granite, Whiteside and Yorkville granites, and similar rocks of igneous origin.

The rocks of the third unit-area yield generally small, sometimes moderate, and rarely large supplies of water. Best supplies are from more highly-metamorphosed rocks. Only a few gallons a minute are obtained from wells in unsheared rocks. The water is moderately soft to hard.

Source of Information - The ground-water information in this chapter was extracted from "Bulletin 47, North Carolina Department of Conservation and Development, Progress Report on Ground Water in North Carolina by M. J. Mundorff", prepared in 1945 in cooperation with the Geological Survey, United States Department of the Interior.

Public Water Supplies - Descriptions and chemical character of public supplies of water, both surface and ground water, are contained in Chapter II of this publication.

Chemical Character of Surface Waters - The following material, taken from Bulletin 52, Volumes 1-12, inclusive, published by the North Carolina Department of Conservation and Development and prepared cooperatively by the Geological Survey, U. S. Department of the Interior, comprises analyses of samples of surface waters in the Kanawha and Watauga River Basins in North Carolina, collected during the period from October 1, 1944 to September 30, 1956, daily for South Fork New River near Jefferson during the water year ending September 30, 1950 and daily for Watauga River near Sugar Grove during the water year ending September 30, 1953, at or near points where continuous stream-measurement stations were maintained. In addition to the daily samples, samples were also collected periodically at miscellaneous stream-measurement sites. This additional data made it possible to predict the chamical character of the streams at various points within the Kanawha and Watauga River Basins. Information regarding definitions and limits of tolerance, pertaining to hardness, conductivity, pH, suspended matter, color, oxygen consumed, dissolved solids, and other characteristics of quality of water, as determined by chemical analyses, may be found in the twelve volumes indicated above and also on pages 80-84, inclusive, "Water Resources of North Carolina", published by the North Carolina Department of Conservation and Development in January 1955.

Buffalo Creek (Kanawha River Basin) at Warrensville, Ashe County

Date	4-14-53	Specific conductance	44.1
Color	4	Bicarbonate	20
pH	7.2	Sulfate	3.6
Silica	13	Chloride	1.6
Iron	0.06	Fluoride	0.1
Calcium	4.1	Nitrate	0.7
Na + K	2.6	Dissolved solids	38
Magnesium	1.8	Total hardness	18

Cove Creek (Watauga River Basin) near Sugar Grove, Watauga County

Date	3-11-47	Bicarbonate	18
Color	5	Sulfate	4.0
pH	6.9	Chloride	1.4
Silica	10	Fluoride	0.1
Iron	0.06	Nitrate	4.6
Calcium	4.7	Dissolved solids	43
Magnesium	1.8	Total hardness	19
Na + K	2.6		

Dutch Creek (Watauga River Basin) at Valle Crucis, Watauga County

Date	2-26-47	Na + K	2.4
Discharge (c.f.s.)	3.49	Bicarbonate	13
Color	7	Sulfate	1.9
pH	7.0	Chloride	0.9
Silica	7.1	Fluoride	0.1
Iron	0.02	Nitrate	1.3
Calcium	2.2	Dissolved solids	23
Magnesium	1.1	Total hardness	10

Elk River (Watauga River Basin) near Elk Park, Avery County

Date	9-26-45	Na + K	2.9
Discharge (c.f.s.)	67	Bicarbonate	15
Suspended matter	4	Sulfate	2.0
Color	8	Chloride	1.0
Silica	9.2	Fluoride	0.1
Iron	0.04	Nitrate	1.0
Calcium	2.7	Dissolved solids	28
Magnesium	0.9	Total hardness	10

Little River (Kanawha River Basin) near Sparta, Alleghany County

Date	10-4-51	7-11-52	11-4-52	4-15-53	7-21-53	9-17-53	7-2-54	8-30-56
Discharge (c.f.s.)	12.6	17.9	11.9	53.1	19.1	11.5	15.4	9.60
Silica	-	8.8	-	-	-	-	-	8.2
Iron	-	0.07	-	-	-	-	-	-
Calcium	-	2.2	-	-	-	-	-	1.7
Magnesium	-	0.7	-	-	-	-	-	0.5
Na + K	-	2.4	12	12	11	11	9	3.8
Bicarbonate	10	12	1	1	1	1	1	11
Sulfate	1	1.4	1.0	1.5	1.0	0.8	1.5	0.5
Chloride	1.2	1.1	-	-	-	-	-	2.4
Fluoride	-	0.0	-	-	-	-	-	-
Nitrate	-	0.9	-	-	-	-	-	0.7
Dissolved solids	-	26	-	-	-	-	-	-
Total hardness	-	8	10	10	8	6	4	6
Specific conductance	32.7	22.0	25.9	35.3	23.6	22.1	21.8	30.6
pH	6.3	6.4	6.7	6.4	7.2	6.5	6.6	7.1

Middle Fork of South Fork New River (Kanawha River Basin) near Blowing Rock, Watauga-Caldwell Counties

Date	10-4-49	4-11-50	9-20-50	2-27-51	5-22-51	7-13-51	9-5-51
Discharge (c.f.s.)	17.3	18.1	31.2	30.2	13.4	8.67	5.36
Color	6	-	-	-	-	-	-
pH	6.3	6.3	6.7	6.5	6.4	6.3	7.0
Specific conductance	23.7	26.0	23.5	25.8	24.6	26.8	34.7
Silica	6.7	-	-	-	-	-	-
Iron	0.04	-	-	-	-	-	-
Calcium	2.2	-	-	-	-	-	-
Magnesium	0.7	-	-	-	-	-	-
Na + K	2.3	-	-	-	-	-	-
Bicarbonate	11	9	12	7	10	10	12
Sulfate	1.4	2	1	2	10	2	3
Chloride	1.5	1.5	1.5	1.5	1.5	1.0	2.0
Fluoride	0.0	-	-	-	-	-	-
Nitrate	1.1	-	-	-	-	-	-
Dissolved solids	22	-	-	-	-	-	-
Total hardness	8	9	7	8	6	6	9

Middle Fork of South Fork New River (continued)

Date	4-16-52	10-6-52	4-9-53	7-21-53	9-18-53	3-11-54	7-30-54
Discharge (c.f.s.)	26.2	5.05	26.8	8.67	3.73	32.4	5.02
pH	6.3	6.6	6.3	6.5	6.7	6.8	6.5
Specific conductance	25.2	29.9	35.6	35.6	35.3	22.9	29.9
Bicarbonate	10	12	9	15	12	9	12

Middle Fork of South Fork New River (continued)

Date	4-16-52	10-6-52	4-9-53	7-21-53	9-18-53	3-11-54	7-30-54
Sulfate	1	1	2	2	2	1	1
Chloride	1.5	1.0	1.2	2.0	2.8	1.2	2.5
Total hardness	8	11	11	10	9	6	8

North Fork New River (Kanawha River Basin) at Bina, Ashe County

Date	5-21-53	Chloride	1.2
Silica	11	Floride	0.1
Iron	0.03	Nitrate	0.6
Calcium	3.7	Dissolved solids	34
Magnesium	1.2	Total hardness	14
Na + K	2.5	Specific conductance	40.1
Bicarbonate	18	pH	6.9
Sulfate	2.3	Color	7

North Fork New River (Kanawha River Basin) at Creston, Ashe County

Date	8-10-49	4-11-50	7-6-51	9-5-51	10-15-51	4-16-52
Discharge (c.f.s.)	88.8	123	76.6	41.4	33.1	101
Color	8	-	-	-	-	-
pH	6.5	6.7	7.3	6.9	6.8	6.7
Specific conductance	17.1	35.1	44.2	47.2	47.6	43.2
Silica	11	-	-	-	-	-
Iron	0.05	-	-	-	-	-
Calcium	4.6	-	-	-	-	-
Magnesium	1.6	-	-	-	-	-
Na + K	2.0	-	-	-	-	-
Bicarbonate	23	16	21	24	23	22
Sulfate	1.4	2	2	1	1	1
Chloride	1.0	0.5	1.0	6.0	0.8	1.0
Fluoride	0.1	-	-	-	-	-
Nitrate	0.7	-	-	-	-	-
Dissolved solids	40	-	-	-	-	-
Total hardness	18	12	17	17	20	15

North Fork New River at Creston (continued)

Date	10-6-52	4-9-53	7-20-53	9-18-53	7-30-54
Discharge (c.f.s.)	26.4	104	49.0	23.5	36.4
Bicarbonate	23	16	23	25	24
Sulfate	1	1	3	2	3
Chloride	0.8	1.0	1.5	1.8	2.0
Total hardness	17.	14.	16	9	17
Specific conductance	45.6	40.0	49.2	49.0	48.3
pH	7.0	6.4	6.5	6.7	7.0

North Fork New River (Kanawha River Basin) at Crumpler, Ashe County

Date	5-12-45	3-23-54	9-13-54	4-14-55	9-15-55	3-20-56
Discharge (c.f.s.)	495	356	62.1	4.720	101	875
Suspended matter	6	-	-	-	3	-
Color	7	8	12	-	-	6
Silica	9.2	9.9	10	-	11	9.4
Iron	0.03	0.00	0.01	-	0.06	0.01
Calcium	2.8	3.4	3.4	3.0	4.2	3.3
Magnesium	1.0	0.4	1.3	1.1	1.4	0.9

North Fork New River at Crumpler (continued)

Date	5-12-45	3-23-54	9-13-54	4-14-55	9-15-55	3-20-56
Na + K	3.0	3.2	4.2	-	3.6	2.1
Bicarbonate	17	14	21	8	25	12
Sulfate	1.9	2.6	3.0	5.9	1.3	2.1
Chloride	0.5	1.0	2.5	1.2	1.5	1.2
Fluoride	0.1	0.1	0.1	-	0.1	0.0
Nitrate	0.8	1.6	1.1	3.9	0.7	2.8
Dissolved solids	29	30	37	35	36	28
Total hardness	11	10	14	12	16	12
Specific conductance	-	46.3	47.1	35.4	47.2	36.8
pH	-	6.8	6.8	6.6	6.9	6.9

North Fork New River (Kanawha River Basin) at Warrensville, Ashe County

Date	4-14-53	Chloride	0.9
Silica	10	Fluoride	0.1
Iron	0.06	Nitrate	0.7
Calcium	3.6	Dissolved solids	31
Magnesium	1.2	Total hardness	14
Na + K	2.7	Specific conductance	33.9
Bicarbonate	18	pH	6.9
Sulfate	2.9	Color	6

South Fork New River (Kanawha River Basin) near Jefferson, Ashe County

Date	5-3-45	8-30-48	12-30-48	4-12-49	10-28-49	10-1-49, 9-30-50 Incl.	5-12-55	9-14-55	3-20-56
Mean discharge (cfs)	482	-	1,270	615	396	489	-	164	502
Suspended matter	14	-	-	-	-	39	-	-	-
Color	11	6	6	2	4	6	7	6	10
Silica	8.0	9.3	7.8	7.2	9.0	10	8.1	9.6	8.2
Iron	0.08	0.06	0.00	0.01	0.02	0.05	0.03	0.14	0.04
Calcium	2.2	2.5	3.4	2.7	2.4	2.9	2.5	2.0	2.7
Magnesium	0.8	0.9	1.2	1.0	0.9	1.1	0.4	1.4	1.0
Na + K	2.2	2.2	0.0	1.0	2.9	2.8	2.7	3.1	1.6
Bicarbonate	13	14	10	11	14	15	12	14	12
Sulfate	1.4	1.2	2.2	1.6	2.2	2.3	1.7	1.9	2.0
Chloride	0.9	1.1	1.1	1.0	1.2	1.7	0.5	1.3	1.0
Fluoride	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0
Nitrate	0.2	0.3	1.8	0.8	0.5	0.9	0.9	0.8	1.8
Dissolved solids	24	29	29	25	26	30	23	27	24
Total hardness	9	10	13	11	10	12	8	11	11
pH	-	6.8	6.4	6.6	6.5	6.6	6.9	7.0	6.8
Specific conductance	-	-	29.8	28.0	31.5	33.9	28.3	33.7	30.4
Oxygen consumed									
Unfiltered	-	-	-	-	-	3.5	-	-	-
Filtered	-	-	-	-	-	1.9	-	-	-
Temperature						56			

Watauga River near Sugar Grove, Watauga County

Date	9-26-45	10-1-52 to 9-30-53, incl.
Mean discharge (cfs)	124	141
Suspended matter	47	9
Color	5	10
Silica	12	9.5
Iron	0.03	0.05
Calcium	4.8	3.7
Magnesium	1.8	1.0
Na + K	3.8	3.5
Bicarbonate	25	16
Sulfate	3.3	2.7
Chloride	1.5	2.4
Fluoride	0.1	0.1
Nitrate	1.8	1.4
Dissolved solids	42	35
Total hardness	19	13
Temperature	-	58
pH	-	6.7
Specific conductance	-	45.2
Oxygen consumed		
Unfiltered	-	3.4
Filtered	-	2.6

Responsibility for Pollution Abatement - The General Assembly of North Carolina, on April 6, 1951, ratified an act to rewrite Article 21 of Chapter 143 of the General Statutes relating to stream sanitation. The act created, within the State Board of Health, a permanent committee known as the State Stream Sanitation Committee, the duties of which are (1) to develop and adopt classifications of State waters, (2) to survey all waters and identify those which ought to be classified, (3) to assign a classification to each identified water, and (4) to hold public hearings regarding assigned classifications.

After the effective date of the assignment of classifications pertaining to the identified waters of any watershed within the State, no person shall, to an extent which would adversely affect the condition of the receiving water within such watershed in relation to any of the standards applicable to such water, take any of following actions:

(1) Make any new outlet into the waters of such watershed;
(2) Construct or operate any new disposal-system within such watershed;
(3) Alter or change the construction, or the method of operation, of any existing disposal-system within such watershed;
(4) Increase the quantity of sewage, industrial waste, or other waste discharged through any existing outlet or processed in any existing disposal-system; or
(5) Change the nature of the sewage, industrial waste or other waste discharged through any existing outlet or processed in any existing disposal-system.

The Committee is empowered to (a) grant a permit, with such conditions as the Committee deems necessary, to achieve the purposes of control of new sources of pollution; (b) grant any temporary permit for such period of time as the Committee shall specify, even though the action allowed by such permit may result in pollution or increased pollution, where conditions may make such temporary permit essential; and (c) modify or revoke any permit upon not less than 60 days' written notice to any person affected.

The act provides that the Committee may issue special orders directing any person responsible for pollution to take action to alleviate or eliminate pollution, that no person shall discharge waste in violation of a special order issued by the Committee, that no special order shall be issued except after hearing unless the person affected thereby consents, and that the person against whom a special order is issued shall have the right to appeal.

The Committee shall make thorough investigations of proposed plans for voluntary action in remedying pollution situations, shall have the power to issue certificates of approval of such plans, may specify further rules applicable to granting of certificates, and shall have power for modifications of certificates of approval.

Pollution-Abatement Accomplishments - The Committee established classifications and water-quality standards, pertaining to the waters of North Carolina, in 1953 after holding public hearings thereon at Asheville, Charlotte, Greensboro, Fayetteville, and Washington.

Classifications of waters of the Yadkin-White Oak, Chowan, Roanoke, and French Broad River Basins have been adopted by the Committee, and comprehensive pollution-abatement plans for these basins have been approved. The comprehensive

pollution-abatement plan for the French Broad River Basin, and proposed classifications of waters of the Cape Fear River Basin, were considered by the Committee on July 25, 1958. Adoption of classifications of waters of the Cape Fear and Neuse River Basins was planned for accomplishment by the end of 1958. Surveys of waters of the Catawba, Tar, Pasquotank, and Tuckasegee River Basins were in progress at that time.

Surveys of waters of the Kanawha and Watauga River Basins were scheduled for future accomplishment.

CHAPTER IX - WATERSHED MANAGEMENT

General - Information regarding water control; problems of watershed management; the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 2nd Session, approved August 4, 1956); the first annual National Watershed Congress (December 6 and 7, 1954); and the North Carolina Soil Conservation Districts Law, enacted by the 1937 Session of the General Assembly, may be found in Chapter XIII of "Water Resources of North Carolina, Department of Conservation and Development, 1955". The quoted publication comprises Volume I of a series of 12 volumes pertaining to the water resources of the State, of which the material herein, regarding the water resources of the Kanawha and Watauga River Basins, forms Volume XI.

Soil Conservation Practices Accomplished and Contemplated - The data contained in the following tables of "Soil Conservation Practices Accomplished" and "Soil Conservation Practices Contemplated" were furnished by the State Conservationist, Soil Conservation Service, U. S. Department of Agriculture, Raleigh, North Carolina, for four counties lying wholly or partially within the Kanawha and Watauga River Basins.

These four counties are included in three Soil Conservation Districts as follows:

Soil Conservation Districts	Counties
New River District	Alleghany and Ashe
Watauga County District	Watauga
Avery County District	Avery

All or a part of the following counties lie in river basins as follows:

Avery County	Northwestern Section - Watauga
	Southwestern Section - French Broad
	Eastern Section - Catawba
Ashe County	All - New
Alleghany County	All - New
Watauga County	Western Section - Watauga
	Central Section - New
	Western Section - Yadkin
	Small area on South-Central border - Catawba

The records of the State Conservationist are maintained on a district, and on a county, basis. Consequently, when a county lies in two or more basins, it was necessary for the State Conservationist to use estimates instead of actual accomplishments. He feels sure, however, that the figures of the two tables are accurate enough for all practical purposes.

The large number of district cooperators, shown on the table of "Soil Conservation Practices Contemplated", does not necessarily signify an unwillingness on the part of farmers to carry out soil conservation plans. On the other hand, it simply means that the small number of Soil Conservation Service technicians available in North Carolina have been unable thus far to work with all of these farmers. The State Conservationist hopes to reach them all as rapidly as possible.

Watershed Protection and Flood Prevention - As of September 10, 1958, the North Carolina Department of Conservation and Development had no knowledge of any

watershed in the Kanawha and Watauga River Basins for which an application for planning assistance, under the provisions of Public Law 566, 83rd Congress, approved August 4, 1954, had been submitted to the State Conservationist, Soil Conservation Service, U. S. Department of Agriculture, Raleigh, North Carolina.

SOIL CONSERVATION PRACTICES ACCOMPLISHED

ITEM	UNIT	ALLEGHANY	ASHE	AVERY	WATAUGA	TOTAL
Closed Drains	L.Ft.	101,940	311,422	5,760	71,163	490,285
Conservation Crop Rotation	Acres	9,084	10,580	222	2,773	22,659
Contour Farming	Acres	10,073	10,720	240	1,669	22,702
Contour Strip Cropping	Acres	4,861	4,547	111	978	10,497
Cover Cropping	Acres	6,466	3,738	142	10,496	20,842
Critical Area Planting	Acres	43	-	-	72	115
Crop Residue Utilization	Acres	1,094	1,682	115	1,167	4,058
Drainage	Acres	1,287	3,777	142	355	5,561
Improvement Cutting	Acres	8,884	-	9	1,186	10,079
Open Drains	Miles	15	18.4	1.3	5.6	40.3
Open Drains	Cu.Yds.	90,000	75,260	11,098	13,385	189,743
Pasture Planting	Acres	4,175	9,016	332	2,111	15,634
Pond Construction	No.	70	-	10	61	141
Sprinkler Irrigation Systems	No.	6	-	3	3	12
Sprinkler Irrigation Systems	Acres	274	-	7.5	70	351.5
Terracing	Miles	-	-	-	-	-
Tree Planting	Acres	1,068	1,213	34	267	2,582
Waterway Development	Acres	845	604	-	89	1,538
Wildlife Area Improvement	Acres	57	97	7	16	177
District Cooperators	No.	899	1,267	318	451	2,935

SOIL CONSERVATION PRACTICES CONTEMPLATED

ITEM	UNIT	ALLEGHANY	ASHE	AVERY	WATAUGA	TOTAL
Closed Drains	L.Ft.	79,355	204,475	7,796	497,820	789,446
Conservation Crop Rotation	Acres	4,648	4,288	2,614	8,079	19,629
Contour Farming	Acres	7,106	5,028	1,929	23,379	37,442
Contour Strip Cropping	Acres	13,556	4,730	1,780	13,379	33,686
Cover Cropping	Acres	14,996	5,652	2,629	15,504	38,781
Critical Area Planting	Acres	3,387	-	-	9,928	13,315
Crop Residue Utilization	Acres	24,332	5,815	1,685	19,783	51,615
Drainage	Acres	3,487	11,823	371	2,295	17,976
Improvement Cutting	Acres	11,897	-	291	65,406	77,594
Open Drains	Miles	198	116	10.7	58.6	383.3
Open Drains	Cu.Yds.	1,188,000	85,220	53,000	293,000	1,619,220
Pasture Planting	Acres	8,192	66,430	1,103	25,464	101,189
Pond Construction	No.	27	-	27	174	228
Sprinkler Irrigation Systems	No.	275	-	-	19	294
Sprinkler Irrigation Systems	Acres	7,076	-	-	470	7,546
Terracing	Miles	-	-	-	-	-
Tree Planting	Acres	17,822	1,526	1,362	13,076	33,786
Waterway Development	Acres	478	12,405	-	2,684	15,567
Wildlife Area Management	Acres	1,878	88	46	154	2,166
District Cooperators	No.	696	2,619	1,468	2,188	6,971

Navigation - None of the streams in the Kanawha and Watauga River Basins in North Carolina are used for navigation from the standpoint of commerce.

Flood Control - The Moores Ferry Reservoir, a unit of the comprehensive flood-control plan for the Ohio River Basin, would be located in Grayson County, Virginia, and Alleghany County, North Carolina. The project provides for a concrete-gravity dam on New River near Galax, Virginia, about 7.5 miles north of the Virginia-North Carolina State line and would control the runoff from a drainage area of 1,130 square miles. The reservoir would overflow lands in North Carolina only along the short segment of New River between its re-entry into North Carolina from Virginia and its second entry into Virginia from North Carolina.

The dam would have a maximum height above stream bed of 172 feet, a total length of 1,320 feet, an uncontrolled overflow-spillway, and outlet works through the structure. A conservation pool would be provided at elevation 2,275 feet which would have a storage capacity of 60,000 acre-feet and an area of 2,000 acres. Above this pool, to elevation 2,357 feet, a storage capacity of 361,000 acre-feet would be reserved for the temporary storage of flood flows. The reservoir would be operated as a unit of an authorized, coordinated reservoir-system for flood protection in the valleys of New, Kanawha, and Ohio Rivers. The Moores Ferry Reservoir, when constructed, will be operated by the District Engineer, Corps of Engineers, U. S. Army, Huntington, West Virginia. This operation would be in accordance with the organization under which the District Engineer at Norfolk is operating the John H. Kerr Reservoir, parts of which lie in Granville, Vance, and Warren Counties, and the District Engineer at Charleston would operate the flood-control reservoir on the Yadkin River upstream from Wilkesboro, when constructed.

In addition to providing reductions of flood heights throughout the Ohio Valley and certain tributary valleys, the coordinated system of reservoirs is specifically designed to reduce the maximum anticipated-flood on the Ohio River to a stage below the tops of local-protection-walls and levees on that stream and to contribute to the reduction of flood heights on the Lower Mississippi River. To the extent consistent with flood-control purposes, the reservoir would be developed for recreation activities, to provide increased low-flows for pollution abatement and water supplies, and for the beneficial use of agricultural lands, forests, and fish and wildlife resources.

In the event that Congressional authority should be granted for a multipurpose flood control and power project at this site, the storage capacity would be increased and utilized for the generation of hydroelectric power and for regulation of flows to increase the output of downstream hydro-developments.

The estimated cost of the project is $25,600,000. The project has been deferred for restudy.